REMARKS

Claim 1-5 and 7-20 remain pending. Claim 6 has been canceled. Claim 1 has been amended to add to it the limitations from now-canceled, dependent claim 6. As a result, no new matter is introduced through the amendment. Since the amended scope of claim 1 is no different than prior claim 6, no new issue requiring further search or examination is required. The total number of claims has been reduced. Entry of the amendment under Rule 116 is requested. Applicants submit that the amendment places the application in condition for allowance, but in any event the amendment simplifies the issues for the appeal.

Claims 1-15, 18 and 19 remain rejected under 35 U.S.C. 103(a) as being unpatentable over Randall et al. (U.S. 2002/0155282) in view of Ali (U.S. 4,647,486). This rejection is respectfully traversed.

Randall 2002/0155282 (hereinafter the Randall 2002 Publication) does not disclose the percent thickness of the mat that the coating extends into the fibrous mat. All of the pending claims specifically require that the coating extend into said fiber mat a distance between about 30 and 50 percent of the thickness of the mat. That structural detail is not even suggested in the Randall 2002 publication. While the Randall 2002 publication describes a set of parameters, including mat thickness, coating application rates and coating thicknesses, which might on occasion provide a penetration percentage required by the pending claims, obtaining the claimed amount of penetration is NOT an inherent consequence of selecting every possible combination of those parameters within the disclosed ranges. Simply because the prior art might occasionally (haphazardly) provide a structure that is required as one aspect of the claimed gypsum board is

not enough to sustain an obviousness rejection based on that prior art. Here, the Randall 2002 publication does not teach that the strength of the bond between the pre-coated mat facer and the core of the gypsum board, as measured by the bond tensile property using the procedure described in Example 3 of the pending application, is maximized by maintaining the coating penetration, in combination with the other recited properties, in the range of 30% to 50% of the mat thickness. See the results presented in Example 3 of the subject application. Absent such disclosure, Randall does not make the clamed invention obvious.

The Office Action contends that the values provided by the Randall 2002 publication "imply" the claimed penetration limitation. Applicants challenge the hindsight analysis used to construct the alleged implication. A skilled worker given the range of values taught in the Randall 2002 publication, and in the absence of the teachings of the present invention, would not have found it necessary (or even beneficial) to limit the depth of coating penetration to within the claimed range. Even assuming that such an implication exists, however, an implication does not provide a legally justified basis for sustaining a rejection based on obviousness.

As explained in the accompanying declaration by Mr. Randall, making gypsum board of maximum structural integrity from a pre-coated fiber mat and a gypsum slurry requires a careful balancing of the dynamic process by which the gypsum slurry invades the non-coated side of the mat and penetrates into the mat. The ease and completeness of that penetration is influenced by the microporosity of the coating on the mat, the thickness of that coating (which is directly proportional to the coating weight) and the proportion of the mat that had been penetrated by the coating.

When the microporosity of the coating is too low, the gypsum slurry fails to adequately displace the internal air from the mat, *i.e.*, the air which fills the interstitial region of the fiber mat before the coating step ensues. With the air in its way, the gypsum slurry does not penetrate completely through the non-coated side of the mat to form a substantially complete interface and to form an adequate bond with the surface of the coating that is internal to the fiber mat (*i.e.*, the interface between regions 31 and 32 in Figure 3 of the application). Figure 4 of the application illustrates a gypsum board in which the process failed to form a complete interface and accordingly an adequate bond.

As explained by Mr. Randall, the depth that the coating penetrates into the mat also impacts the nature of the interaction between the gypsum slurry, the fiber mat and the coating on the fiber mat during the dynamic board formation process. A fiber mat having a coating which penetrates more than 50% of the thickness of the mat so-limits the degree of gypsum slurry penetration into the mat that the bond between the core and the mat suffers. At the opposite limit, if the coating penetration is less than 30% of the thickness of the fiber mat, then the gypsum slurry insufficiently penetrates the mat and can not form an adequate bond with the surface of the coating that is internal to the fiber mat (*i.e.*, the interface between regions 31 and 32 in Figure 3 of the application)

Mr. Randall further explains that if the microporosity of the coating is too high, then the gypsum slurry bleeds through the coating, often in a non-uniform fashion during the formation of the gypsum core. This bleed-through not only creates an unsightly surface on board and a clean-up problem for the manufacturing line, but it also interferes with later obtaining a satisfactory

bond between the surface of the board and any decorative, *e.g.,* tiles, or functional elements, *e.g.,* insulation panels, that may be attached to the coated gypsum board.

Mr. Randal concludes that even though his earlier published patent application, the Randall 2002 publication, discloses (1) overlapping values for mat thickness (paragraph [0038]), (2) overlapping values for coating weight (paragraph [0051]), (3) coating thicknesses of 4 to 30 mils (paragraph [0052], which can be urged to provide (though there is no disclosure of) overlapping values of coating penetration and (4) a functional need for sufficient porosity in the coating to allow water vapor to pass through the coating during board drying (paragraph [0058]), that publication does NOT recognize the importance of a proper level of microporosity, particularly in relation to the other parameters, for maximizing board integrity by positively influencing the dynamic process of slurry penetration during board manufacture. Nothing in the Randall 202 publication provides a reasonable expectation that there exists a combined set of parameters that would be ideal for allowing the slurry to penetrate through the mat to the surface of the coating that is internal to the fiber mat (*i.e.,* to the interface between regions 31 and 32 in Figure 3 of the application) to form a adequate bond.

The Office Action asserts that the microporosity required by the claims is inherent in the prior art structure of the gypsum board of the Randall 2002 publication, but does not provide any support for its contention. The declaration by Mr. Randall explains that coating morphologies suitable for permitting mat drying as described in paragraph [0058] of the Randall 2002 publication would not inherently be the same as the microporosity required by the pending claims. Indeed, both lower levels and higher levels of porosity in the coating would be suitable

to satisfy the functional requirement for board drying. As Mr. Randall noted, the configuration of Figure 4 illustrates an embodiment that exhibited adequate board drying, but inadequate slurry penetration and thus unsatisfactory board properties.

The Office Action also admits that Randall does not recognize the significance that gypsum core calcination in the vicinity of the coated mat facer has on gypsum board strength. Instead the Office Action relies on Ali, U.S. 4,647,486 (hereinafter Ali), to contend that a skilled worker would have found it obvious to adapt this requirement to Randall in order to improve board fire barrier properties.

Ali describes a gypsum board having increased fire resistance. The focus of the Ali invention is the incorporation of calcium sulfate anhydrite, preferably in fibrous form, into the gypsum core of the board to obtain that increased resistance. The Office Action refers to the disclosure at column 1, lines 20-23 of Ali (BACKGROUND OF THE INVENTION). Here, the description merely states a known fact that gypsum (hydrated calcium sulfate or calcium sulfate dihydrate - $CaSO_4 \cdot 2H_2O$) contains about 21% (actually 20.9%) by weight "chemically combined water" and that the "chemically combined water" contributes to the effectiveness of gypsum board products (as a general proposition) as a fire barrier. However, the level of calcination in the vicinity of the board surface is not a point of consideration in Ali.

In particular, Ali does not suggest that the exact stoichiometry of hydrated gypsum must be maintained across the entire cross-section of the commercially produced gypsum board either to maintain the desired structural properties of the board or to maintain the effectiveness of the board as a fire barrier. Indeed, to the extent Ali uses calcium sulfate anhydrite II in the board,

the absolute dihydrate stoichiometry is disturbed. That notwithstanding, however, maintaining the exact dihydrated relationship across the entire cross-section of any commercially produced gypsum board, particularly in the surface portion of the board, is difficult to do in practice because the final heating of the board in the drying oven, following initial hydration, tends to impact the board surfaces disproportionately to the board's interior. Ali does not suggest any particular limit on such surface calcination that unavoidably accompanies commercial board drying operations. See the Randall Rule 132 declaration, paragraph 14.

The present invention thus is based on the determination by the inventors that to maximize the strength of the bond between a pre-coated mat and the gypsum core that several inter-related factors, including the coating's microporosity (as recited in the claims) must be properly maintained in balance. The prior art neither discloses nor suggests the importance of maintaining such inter-relationships for maximizing bond strength.

Claims 16 and 20 have been rejected under 35 U.S.C. 103(a) as being unpatentable over Randall in view of Ali and further in view of Babcock et al., U.S. 4,746,365 (Babcock). Claim 17 has been rejected under 35 U.S.C. 103(a) as being unpatentable over Randall in view of Ali and Babcock and further in view of Miyakoshi, U.S. 5,837,788. These rejections are respectfully traversed.

These rejections depend on the sufficiency of the earlier rejection based on the combination of Randall and Ali for their sufficiency. As discussed above, the combination of Randall with Ali does not make the invention defined by claim 1 obvious. Since claims 16, 17 and 20 all depend in one way or another on claim 1, these claims are patentable for the same

reasons. These combinations thus fail to sustain the case for obviousness for the same reasons advanced above in connection with the earlier obviousness rejection.

All claims also stand rejected for obviousness-type double patenting over either (1) claims 1, 3-16 and 18-23 of copending application No. 10/417,344 (the '344 application) or (2) claims 1-20 of U.S. 6,808,793 (the '793 patent), both in view of Ali. These rejections are respectfully traversed.

As regards these rejections, none of the claims in either the '344 application, or in the '793 patent adds anything to what is presented by the statutory obviousness rejection based on the Randall and Ali combination concerning the inter-related factors recited in the claims that must be properly maintained in balance to obtained the strength improvement of the present invention. Indeed, the same can be said about the complete specification of these disclosures (in an obviousness-type double patenting rejection the obviousness analysis is limited to the subject matter described by the claims). As noted by Mr. Randall in his declaration, US 6,808,793 has an identical specification to the Randall 2002 publication (which publication then matured into and thus is the same as US 6,770,354). Thus, the '793 patent has the same short-comings as described above in connection with the Randall 2002 publication. Similarly, the teachings in co-pending application 10/417,344 have the same short-comings as described above in connection with the Randall 2002 publication. None of these disclosures describes or suggests the critical inter-relationship of the recited parameters on the structural integrity of coated fiber mat-faced gypsum boards, as reflected in the pending claims.

On the basis of the above, the claims stand in condition for allowance. The allowance of

the claims is thus respectfully requested.

Respectfully submitted,

Date: August 2, 2006

Joseph M. Skerpon
Registration No. 29,864

BANNER & WITCOFF, LTD.
1001 G Street, N.W., Eleventh Floor
Washington, D.C. 20001-4597
(202) 824-3000

1027840-1